



## Alkaline toxicosis

An Aussie that snacked  
on AA batteries **322**

## Anesthesia reboot

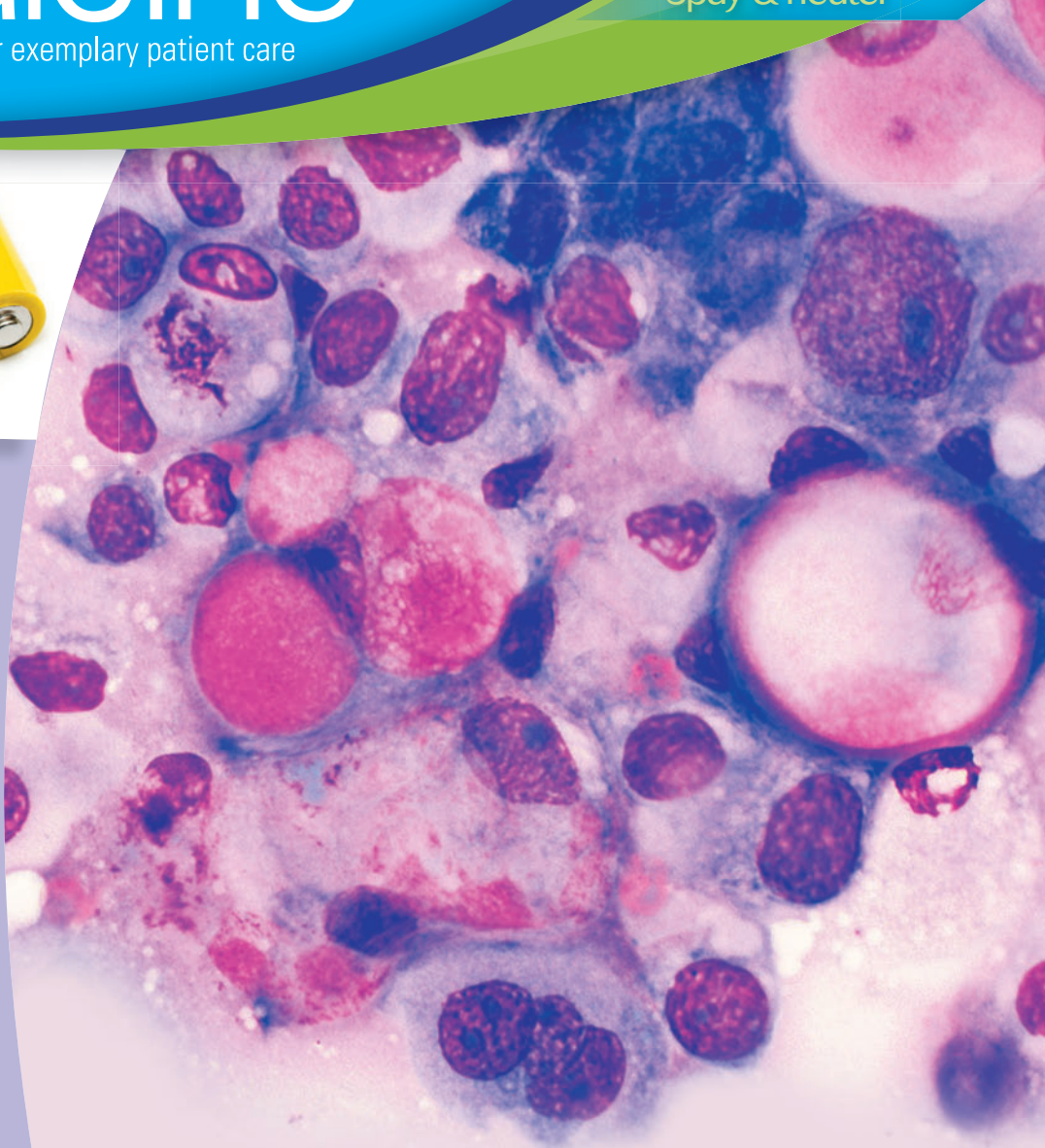
Erase these 5 myths  
about anesthetizing  
dogs and cats **318**

## Journal Scan

When a cat gets  
Addison's disease **320**

## Idea Exchange

- ▶ Clean centrifuges  
with less mess **336**
- ▶ Cover up fecal  
sample odors **336**



# Transitional cell CARCINOMA

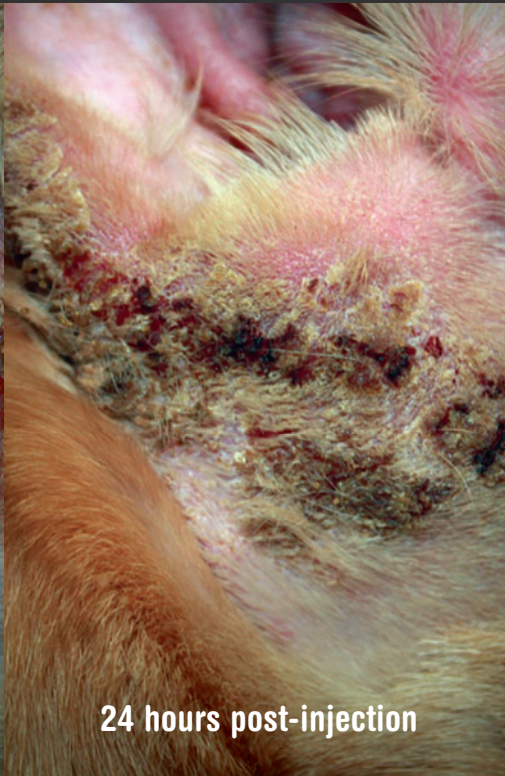
Get an entire clinical team's point of view  
on the best way to diagnose and treat this  
urinary tract neoplasia in dogs. **p327**

See how quickly clinical signs of bacterial skin infections can begin to improve with **CONVENIA® (cefovecin sodium)**.<sup>\*,†</sup>

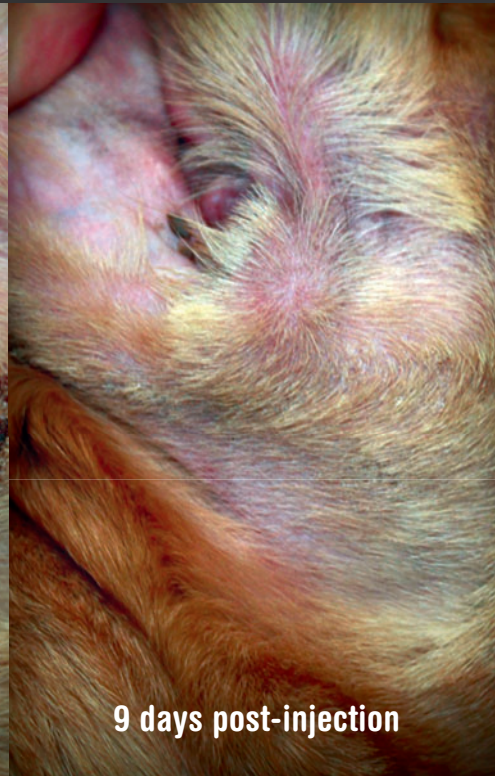
Photos: David Bird, DVM



Baseline



24 hours post-injection



9 days post-injection

**Fast.**

**Effective.**

**Treatment.**

<sup>\*</sup>Eleven-month-old Labrador retriever with **acute moist dermatitis** treated only with CONVENIA 8 mg/kg.

<sup>†</sup>Case included an initial skin cleansing with a dilute topical antiseptic.

For more information, go to [convenia.com](http://convenia.com) or talk to your Zoetis representative.



**IMPORTANT SAFETY INFORMATION:** People with known hypersensitivity to penicillin or cephalosporins should avoid exposure to CONVENIA. Do not use in dogs or cats with a history of allergic reactions to penicillins or cephalosporins. Side effects for both dogs and cats include vomiting, diarrhea, decreased appetite/anorexia and lethargy. For more information, please see Brief Summary of full Prescribing Information on page 321.

All trademarks are the property of Zoetis Inc., its affiliates and/or its licensors.  
©2014 Zoetis Inc. All rights reserved. October 2014. AIF-00189

**zoetis**



## Content Group

Editor/Medicine Channel Director | **Mindy Valcarcel**  
mvalcarcel@advanstar.com

Medical Editor | **Heather Lewellen, DVM**

Content Manager | **Adrienne Wagner**

Senior Content Specialists | **Alison Fulton** |

**Heather Biele, DVM**

Assistant Content Specialist | **Victoria Biondi**

Technical Editor | **Jennifer Vossman, RVT**

Consulting Technical Editor | **Avi Blake, DVM**

Digital Channel Director | **Jessica Zemler**

Senior Designer/Web Developer | **Ryan Kramer**

Art Director | **Steph Bentz**

Multimedia Contributor | **Troy Van Horn**

## Advanstar Veterinary

Vice President/General Manager

| **Becky Turner Chapman**

Group Content Director | **Marnette Falley**

Medical Director | **Theresa Entrikey, DVM**

Director, Electronic Communications | **Mark Eisler**

Director, The CVC Group | **Peggy Shandy Lane**

## Sales Group

Sales Director | **David Doherty**

Senior Account Managers, Advertising

**Terry Reilly** | **Chris Larsen**

Account Manager, Advertising | **Angela Paulovcin**

Senior Account Manager, Projects | **Jed Bean**

Sales and Projects Coordinator | **Anne Belcher**

Books/Resource Guides | **Maureen Cannon**  
(440) 891-2742

List Rental Sales | **Renée Schuster**  
(440) 891-2613, rschuster@advanstar.com



Chief Executive Officer | **Joe Loggia**

Chief Executive Officer Fashion Group,

Executive Vice-President | **Tom Florio**

Executive Vice President, Chief Administrative Officer

& Chief Financial Officer | **Tom Ehardt**

Executive Vice President | **Georgiann DeCenzo**

Executive Vice President | **Chris DeMoulin**

Executive Vice President, Business Systems

| **Rebecca Evangelou**

Executive Vice President, Human Resources

| **Julie Mollenstam**

Senior Vice President | **Tracy Harris**

Vice President, Legal | **Michael Bernstein**

Vice President, Media Operations | **Francis Heid**

Vice-President, Treasurer & Controller | **Adele Hartwick**

## Mission

*Veterinary Medicine* is a peer-reviewed journal dedicated to providing concise, credible, and essential information on the most common and crucial clinical problems seen in companion-animal practice.

## Editorial Advisory Board

Leading specialists who direct our content and ensure our editorial quality and integrity

**Joseph W. Bartges, DVM, PhD, DACVIM, DACVN**

**David S. Bruyette, DVM, DACVIM**

**Barret Bulmer, DVM, MS, DACVIM**

**John Ciriabassi, DVM, DACVB**

**Timothy M. Fan, DVM, DACVIM**

**Juliet R. Gionfriddo, DVM, MS, DACVO**

**Karen A. Moriello, DVM, DACVD**

**Jennifer Wardlaw, DVM, MS, DACVIMS**

## Practitioner Advisory Board

Progressive practitioners who keep our content practical, timely, and relevant

**Mili Bass, DVM, DABVP**

**Robin Downing, DVM**

**Corey Entrikey, DVM**

**Wayne L. Hunthausen, DVM**

**Thomas McCoy, DVM**

**Melissa M. Mckendry, DVM, DABVP**

**Fred L. Metzger Jr., DVM, DABVP**

**Robert M. Miller, DVM**

**Gary D. Norsworthy, DVM, DABVP**

**R. Wayne Randolph, VMD**

**Michael H. Riegger, DVM, DABVP**

**David Robbins, DVM**

**Philip VanVranken, DVM**

**Laura L. Wade, DVM, DABVP**



**Subscriber Services:** Call (800) 815-3400 in the United States, or (888) 527-7008 or (218) 740-6477 in Canada; fax (218) 740-6417; or write to: *Veterinary Medicine*, 131 W. 1st St., Duluth, MN 55802-2065. If you are unable to connect with the 800 numbers, email fulfill@superfill.com. **Reprint Services:** Call 1-877-652-5295 ext. 121 or email bkolb@wrightsmedia.com. Outside US, UK, direct dial: 281-419-5725 ext. 121 **Back Issues:** Individual copies are available for one year; to order, call (800) 598-6008. Permissions/International Licensing. Call Maureen Cannon at (440) 891-2742. **List Sales:** Please contact List Account Executive Renée Schuster at (440) 891-2613. **Editorial Offices:** Write to 8033 Flint, Lenexa, KS 66214; or call (913) 871-3800. **Visit our websites:** dvm360.com; thecvc.com; industrymatter.com.

## STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION (Requester Publications Only) (Required by 39 USC 3685)

1. Publication Title: Veterinary Medicine
2. Publication Number: 8750-7943
3. Filing Date: 9/30/14
4. Issue Frequency: Monthly
5. Number of Issues Published Annually: 12
6. Annual Subscription Price (if any): \$60.00
7. Complete Mailing Address of Known Office of Publication:  
131 West First Street, Duluth, St. Louis County,  
Minnesota 55802-2065  
Contact Person: Kelly Kemper  
Telephone: 218-740-7285
8. Complete Mailing Address of Headquarters or General Business Office of Publisher:  
2501 Colorado Avenue, Suite 280, Santa Monica, CA 90404
9. Full Names and Complete Mailing Addresses of Group Sales & Marketing Director: David Doherty, 8033 Flint, Lenexa, KS 66214  
Group Content Director: Marnette Falley, 8033 Flint, Lenexa, KS 66214  
Content Manager: Adrienne Wagner, 8033 Flint, Lenexa, KS 66214
10. This publication is owned by: Advanstar Communications Inc., 2501 Colorado Avenue, Suite 280, Santa Monica, CA 90404. The sole shareholder of Advanstar Communications Inc. is: Advanstar, Inc., whose mailing address is 2501 Colorado Avenue, Suite 280, Santa Monica, CA 90404.
11. Advanstar Communications Inc. is a borrower under Credit Agreements dated June 6, 2013, with various lenders as named therein from time to time. As of August 7, 2014, the agent for the lenders is: Goldman Sachs Lending Partners LLC, Administrative Agent, 30 Hudson St, 4th Floor, Jersey City, NJ 07302.
12. Does Not Apply
13. Publication Title: Veterinary Medicine
14. Issue Date for Circulation Data Below: August 2014
15. Extent and Nature of Circulation

	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
A. Total Number of Copies	41,198	40,587
B. Legitimate Paid and/or Requested Distribution		
1. Outside County Paid/Requested Mail Subscriptions Stated on PS Form 3541	26,195	26,354
2. In-County Paid/Requested Mail Subscriptions Stated on PS Form 3541	0	0
3. Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid or Requested Distribution Outside USPS	504	448
4. Requested Copies Distributed by Other Mail Classes Through the USPS	0	0
C. Total Paid and/or Requested Circulation (Sum of 15b (1), (2), (3), and (4))	26,699	26,802
D. Non-requested Distribution		
1. Outside County Non-requested Copies Stated on PS Form 3541	14,042	13,324
2. In-County Non-requested Copies Stated on PS Form 3541	0	0
3. Non-requested Copies Distributed Through the USPS by Other Classes of Mail	0	0
4. Non-requested Copies Distributed Outside the Mail	304	389
E. Total Non-requested Distribution (Sum of 15d (1), (2), (3) and (4))	14,346	13,713
F. Total Distribution (Sum of 15c and e)	41,045	40,515
G. Copies not Distributed	153	72
H. Total (Sum of 15f and g)	41,198	40,587
I. Percent Paid and/or Requested Circulation	65.05%	66.15%

\*If you are not claiming electronic copies, skip to line 17

A. Requested and Paid Electronic Copies

B. Total Requested and Paid Print Copies (Line 15C) + Requested/Paid Electronic Copies

C. Total Requested Copy Distribution (Line 15F) + Requested/Paid Electronic Copies

D. Percent Paid and/or Requested Circulation (Both Print & Electronic Copies)

☐ I certify that 50% of all my distributed copies (electronic and print) are legitimate requests or paid copies.

17. Publication of Statement of Ownership for a Requester Publication is required and will be printed in the October issue of this publication.

Name and Title of Editor, Publisher, Business Manager, or Owner:

Kristina Bildeaux, Audience Development Director

*Kristina Bildeaux*

Date: 9/30/14

I certify that the statements made by me above are correct and complete.

# Anesthesia reboot: Erase these *myths* and *misconceptions*

Veterinary anesthesiologist Dr. Ann Weil provides five important pointers on anesthetizing cats and dogs.

By Ann Weil, DVM, DACVAA

**A**re you up-to-date on the best anesthetic practices to use in your patients? You may be holding on to important misconceptions, including the following:

1. It is true that most opioids can cause hyperthermia in cats. A recent study has shown a strong association of hyperthermia with hydromorphone, especially when ketamine is used concurrently.<sup>1</sup> My solution: Administer a microdose of medetomidine (1 µg/kg) postoperatively in cats that have received hydromorphone and ketamine.
2. Misconceptions abound in terms of breed “sensitivities” to anesthetic drugs. The only documented sensitivity is associated with greyhounds and barbiturates. Their livers cannot process these drugs in the same manner as other dogs. However, since barbiturates are rarely used anymore, this problem is almost obsolete.
3. Excessive bradycardia from dexmedetomidine should be handled by reversing the drug with atipamezole, not by using an anticholinergic such as atropine or glycopyrrolate. Partial reversal can be done with a half dose of atipamezole.
4. If you are giving injectable combinations of anesthetic drugs, keep in mind that hypoxemia and hypercapnia are likely. Thus, be sure to use an oxygen mask in these patients.



5. Stop using the old-school 10 ml/kg/hr anesthetic fluid rate as a guide. The 2013 American Animal Hospital Association and American Association of Feline Practitioners fluid therapy guidelines advise new initial fluid rates: 5 ml/kg/hr in dogs and 3 ml/kg/hr in cats (see [dvm360.com/FluidGuidelines](http://dvm360.com/FluidGuidelines)).

## REFERENCE

1. Posner LP, Gleed RD, Erb HN, et al. Post-anesthetic hyperthermia in cats. *Vet Anaesth Analg* 2007;34(1):40-47.



## Pain control in cats

To hear Dr. Weil discuss the ever-evolving role of butorphanol in treating pain in cats, scan the QR code below or visit [dvm360.com/CVC14Weil](http://dvm360.com/CVC14Weil).



# WHEN TREATING SKIN INFECTIONS, VETERINARIANS—AND PET OWNERS—ARE CHOOSING BEST MEDICINE OVER LOWEST COST

The cost of their pets' healthcare can be a concern for clients—and a discussion veterinarians would sometimes just as soon avoid. This can be the case when treating skin infections, one of the most common health issues bringing clients and their pets into the veterinarian's office.<sup>1</sup> However, a new study demonstrates that clients, including owners of dogs up to 135 pounds, may be less concerned about cost than practitioners often believe.

Veterinarians are familiar with CONVENIA® (cefovecin sodium), an injectable antimicrobial indicated to treat common bacterial skin infections in dogs and cats; however, they may be reluctant to offer it as a first-line treatment because of concerns their clients may consider it too costly. Zoetis recently conducted a study to determine if, in fact, cost was a deterrent to treatment with CONVENIA.

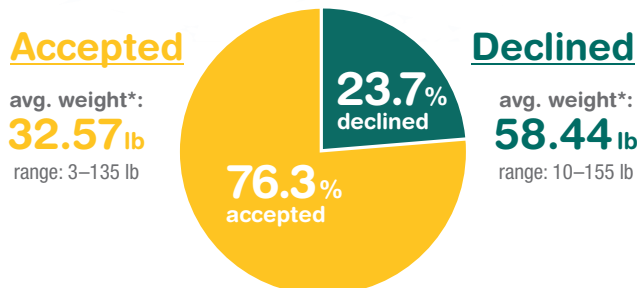
"There is a perception dog owners will not accept the cost of cefovecin sodium compared to less expensive oral medications requiring repeated administration," said Andrea Wright, DVM, MVSc, MBA, associate director, Outcomes Research in the Companion Animal Division at Zoetis.<sup>2</sup>

Thirty veterinarians, who are members of Companion Animal Practices North America (CAPNA™) and are located in 22 different geographical areas of the United States, were asked to offer CONVENIA as a first treatment for appropriate cases. The date of examination, dog weight, and owner acceptance or decline were recorded over two months. The pricing was consistent across all clinics: owners were charged using the weight of the dog multiplied by the clinic's cost of CONVENIA per lb, plus a flat margin.

"The most surprising result was that such a high number of clients, 76.3 percent, accepted treatment with CONVENIA even though the cost was much greater than oral antibiotics requiring repeated owner administration," Dr. Wright said. In

fact, the cost of one-time treatment ranged from three to 17 times more than the oral alternatives.

## Pet owner acceptance of injectable cefovecin sodium as first line of treatment



### One Study Participant's Experience

Todd Rezac, DVM, of Deer Creek Animal Hospital in Littleton, Colorado, participated in the study and was pleased with the results: "When given a choice between two weeks of orally administered medication and one injection at a higher fee, my clients accepted the injection 100 percent of the time." Dr. Rezac noted the response was the same with owners of big dogs and small ones. "I used CONVENIA on dogs weighing 100 pounds or more, and none of my clients refused because of cost."

Dr. Rezac added, "As clinicians, it is our job to offer the best medicine and when treating skin disease, in my view, CONVENIA is the superior product."

He went on to note, "Not only does one injection provide assurance that the full course of treatment has been administered, it removes the client's need to give daily medication and helps alleviate the patient's discomfort more quickly. That's what I tell my clients and let them make the decision."

### IMPORTANT SAFETY INFORMATION:

People with known hypersensitivity to penicillin or cephalosporins should avoid exposure to CONVENIA. Do not use in dogs or cats with a history of allergic reactions to penicillins or cephalosporins. Side effects for both dogs and cats include vomiting, diarrhea, decreased appetite/anorexia and lethargy. For more information, please see Brief Summary of full Prescribing Information on page 321.



<sup>1</sup>Banfield State-of-Pet Health 2014 report.

<sup>2</sup>Wright A, Russo S, Di Franco B, Amodie D, Gasper S. Convenia Client Acceptance Experience Trial. Data on file, 2013, Zoetis Inc.

\*The difference in mean weights between accepted and declined was statistically significant at  $p < 0.0001$ .

# CASE STUDY

## The cat that suffered an Addisonian crisis

### Overview

The authors of this case report describe a 4-year-old spayed female British shorthaired cat that presented with severe weakness, bradycardia (120 beats/min), hypovolemia, and hypothermia (99 F [37.2 C]). The cat's systolic blood pressure was measured and was undetectable.

The owners reported that the cat had been polyuric and polydipsic beginning four weeks earlier but had become progressively weaker and had stopped eating or drinking one week prior to presentation.

**Diagnostic testing.** The results of a complete blood count showed lack of a stress leukogram. The following serum chemistry profile abnormalities were found (reference ranges in parentheses):

- pH = 7.14 (7.31 to 7.39)
- Bicarbonate (mmol/L) = 10.4 (15.5 to 23.9)
- Base excess = -19 (-10.12 to 1.2)
- Sodium (mmol/L) = 121 (141 to 150)
- Potassium (mmol/L) = 8 (3.6 to 4.8)

- Chloride (mmol/L) = 90.8 (110 to 125)
- BUN (mg/dl) = 62.5 (20 to 30)
- Creatinine (mg/dl) = 6.7 (0 to 1.9)
- Phosphorus (mg/dl) = 11.5 (2.5 to 5.9)

The blood glucose concentration was also noted to be at the low end of the reference range. A thoracic radiographic examination revealed microcardia, a

narrow caudal vena cava, and pulmonary hypoperfusion. An abdominal ultrasonographic examination revealed a small left adrenal gland; the right adrenal gland could not be visualized.

**Treatment.** Intravenous crystalloids (0.9% sodium chloride) and hydroxyethyl starch were given as well as sodium bicarbonate to correct the meta-





## Brief Summary of Prescribing Information

**convenia®**  
(cefovecin sodium)

Antimicrobial for Subcutaneous Injection in Dogs and Cats Only

**CAUTION: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.****INDICATIONS:****Dogs**CONVENIA is indicated for the treatment of skin infections (secondary superficial pyoderma, abscesses, and wounds) in dogs caused by susceptible strains of *Staphylococcus intermedius* and *Streptococcus canis* (Group G).**Cats**CONVENIA is indicated for the treatment of skin infections (wounds and abscesses) in cats caused by susceptible strains of *Pasteurella multocida*.

**CONTRAINDICATIONS:** CONVENIA is contraindicated in dogs and cats with known allergy to cefovecin or to  $\beta$ -lactam (penicillins and cephalosporins) group antimicrobials. Anaphylaxis has been reported with the use of this product in foreign market experience. If an allergic reaction or anaphylaxis occurs, CONVENIA should not be administered again and appropriate therapy should be instituted. Anaphylaxis may require treatment with epinephrine and other emergency measures, including oxygen, intravenous fluids, intravenous antihistamine, corticosteroids, and airway management, as clinically indicated. Adverse reactions may require prolonged treatment due to the prolonged systemic drug clearance (65 days).

**WARNINGS:** Not for use in humans. Keep this and all drugs out of reach of children. Consult a physician in case of accidental human exposure. For subcutaneous use in dogs and cats only. Antimicrobial drugs, including penicillins and cephalosporins, can cause allergic reactions in sensitized individuals. To minimize the possibility of allergic reactions, those handling such antimicrobials, including cefovecin, are advised to avoid direct contact of the product with the skin and mucous membranes.

**PRECAUTIONS:** Prescribing antibacterial drugs in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to treated animals and may increase the risk of the development of drug-resistant animal pathogens.

The safe use of CONVENIA in dogs or cats less than 4 months of age and in breeding or lactating animals has not been determined. Safety has not been established for IM or IV administration. The long-term effects on injection sites have not been determined. CONVENIA is slowly eliminated from the body, approximately 65 days is needed to eliminate 97% of the administered dose from the body. Animals experiencing an adverse reaction may need to be monitored for this duration.

CONVENIA has been shown in an experimental *in vitro* system to result in an increase in free concentrations of carprofen, furosemide, doxycycline, and ketoconazole. Concurrent use of these or other drugs that have a high degree of protein-binding (e.g. NSAIDs, propofol, cardiac, anticonvulsant, and behavioral medications) may compete with cefovecin-binding and cause adverse reactions.

Positive direct Coombs' test results and false positive reactions for glucose in the urine have been reported during treatment with some cephalosporin antimicrobials. Cephalosporin antimicrobials may also cause falsely elevated urine protein determinations. Some antimicrobials, including cephalosporins, can cause lowered albumin values due to interference with certain testing methods.

Occasionally, cephalosporins and NSAIDs have been associated with myelotoxicity, thereby creating a toxic neutropenia<sup>1</sup>. Other hematological reactions seen with cephalosporins include neutropenia, anemia, hypoproteobinemia, thrombocytopenia, prolonged prothrombin time (PT) and partial thromboplastin time (PTT), platelet dysfunction and transient increases in serum aminotransferases.

**ADVERSE REACTIONS:****Dogs**

A total of 320 dogs, ranging in age from 8 weeks to 19 years, were included in a field study safety analysis. Adverse reactions reported in dogs treated with CONVENIA and the active control are summarized in Table 2.

**Table 2: Number of Dogs\* with Adverse Reactions Reported During the Field Study with CONVENIA.**

Adverse Reaction	CONVENIA (n=157)	Active Control (n=163)
Lethargy	2	7
Anorexia/Decreased Appetite	5	8
Vomiting	6	12
Diarrhea	6	7
Blood in Feces	1	2
Dehydration	0	1
Flatulence	1	0
Increased Borborygmi	1	0

\*Some dogs may have experienced more than one adverse reaction or more than one occurrence of the same adverse reaction during the study.

Mild to moderate elevations in serum  $\gamma$ -glutamyl trans-ferase or serum alanine aminotransferase were noted post-treatment in several of the CONVENIA-treated dogs. No clinical abnormalities were noted with these findings.

One CONVENIA-treated dog in a separate field study experienced diarrhea post-treatment lasting 4 weeks. The diarrhea resolved.

**Cats**

A total of 291 cats, ranging in age from 2.4 months (1 cat) to 21 years, were included in the field study safety analysis. Adverse reactions reported in cats treated with CONVENIA and the active control are summarized in Table 3.

**Table 3: Number of Cats\* with Adverse Reactions Reported During the Field Study with CONVENIA.**

Adverse Reaction	CONVENIA (n=157)	Active Control (n=163)
Vomiting	10	14
Diarrhea	7	26
Anorexia/Decreased Appetite	6	6
Lethargy	6	6
Hyper/Acting Strange	1	1
Inappropriate Urination	1	0

\*Some cats may have experienced more than one adverse reaction or more than one occurrence of the same adverse reaction during the study.

Four CONVENIA cases had mildly elevated post-study ALT (1 case was elevated pre-study). No clinical abnormalities were noted with these findings.

Twenty-four CONVENIA cases had normal pre-study BUN values and elevated post-study BUN values (37–39 mg/dL post-study). There were 6 CONVENIA cases with normal pre- and mildly to moderately elevated post-study creatinine values. Two of these cases also had an elevated post-study BUN. No clinical abnormalities were noted with these findings.

One CONVENIA-treated cat in a separate field study experienced diarrhea post-treatment lasting 42 days. The diarrhea resolved.

**FOREIGN MARKET EXPERIENCE:** The following adverse events were reported voluntarily during post-approval use of the product in dogs and cats in foreign markets: death, tremors/ataxia, seizures, anaphylaxis, acute pulmonary edema, facial edema, injection site reactions (alopecia, scabs, necrosis, and erythema), hemolytic anemia, salivation, pruritus, lethargy, vomiting, diarrhea, and inappetence.

**For a copy of the Material Safety Data Sheet, (MSDS) or to report a suspected adverse reaction call Zoetis Inc. at 1-888-963-8471.**

**STORAGE INFORMATION:**

Store the powder and the reconstituted product in the original carton, refrigerated at 2° to 8° C (36° to 46° F). Use the entire contents of the vial within 56 days of reconstitution. PROTECT FROM LIGHT. After each use it is important to return the unused portion back to the refrigerator in the original carton. As with other cephalosporins, the color of the solution may vary from clear to amber at reconstitution and may darken over time. If stored as recommended, solution color does not adversely affect potency.

**HOW SUPPLIED:**

CONVENIA is available as a 10 mL multi-use vial containing 800 milligrams of cefovecin as a lyophilized cake.

NADA# 141-285, Approved by FDA

**zoetis**

Distributed by  
Zoetis Inc.  
Kalamazoo, MI 49007

January 2013  
PAA035845A&P

bolic acidosis. Rewarming measures were also taken. Dextrose was added to the fluids, and fluid content was adjusted according to blood gas analysis results. An ACTH stimulation test was performed at the initiation of therapy.

After aggressive therapy and monitoring (continuous echocardiography and blood gas analyses every three hours) over 12 hours, the cat improved and vital parameters normalized.

An oral dose of 0.025 mg fludrocortisone given twice daily and 0.3 mg/kg prednisolone given once daily was begun within 24 hours of presentation. Over the next few days the cat continued to improve, and its clinical signs resolved.

**Definitive diagnosis.** The ACTH stimulation test confirmed a diagnosis of hypoadrenocorticism with both cortisol and aldosterone concentrations not detectable at baseline and after stimulation. At the one-week follow-up visit, mild electrolyte abnormalities were still present, but

the results of a physical examination were normal. The prednisolone was discontinued at this time, and the fludrocortisone was continued as before. Two weeks later, the polyuria/polydipsia returned and the prednisolone was reinstituted. The clinical signs resolved, and the cat was maintained on a 0.2 mg/kg once a day prednisolone dose in conjunction with the fludrocortisone.

### Take-home message

Addison's disease is rare in cats, and the cause remains unclear. The clinical presentation and clinicopathologic abnormalities in this case were similar to what we would expect to see in dogs, except for the severe metabolic acidosis. With appropriate diagnosis and treatment, the long-term prognosis in cats with hypoadrenocorticism is favorable. **VM**

**Sicken J, Neiger R. Addisonian crisis and severe acidosis in a cat: a case of feline hypoadrenocorticism. J Feline Med Surg 2013;15:941-944.**



These "Journal Scan" summaries were contributed by Jennifer L. Garcia, DVM, DACVIM, a veterinary internal medicine specialist at Sugar Land Veterinary Specialists in Houston, Texas.

Read more summaries at  
[dvm360.com/JournalScan](http://dvm360.com/JournalScan).

# AA toxicosis: *Alkaline battery* exposure in a dog



A look at the case management of a 1-year-old Australian shepherd who presented to a veterinary clinic for evaluation after chewing on two AA alkaline batteries.

By Camille DeClementi, VMD, DABT, DABVT

**A** 1-year-old 26-lb (11.8-kg) spayed female Australian shepherd was presented to a veterinary clinic for evaluation one hour after chewing on two AA alkaline batteries.

## History

At home, the owner found two AA alkaline batteries with two small puncture holes in them. The owner noticed a red blotch on the dog's tongue and brought the dog to the clinic.

## Physical examination

On physical examination, the dog was bright, alert, and responsive.

A mild superficial abrasion was noted along the left buccal surface

of the tongue. No other significant changes were noted, and the physical examination was otherwise unremarkable.

## Initial treatment

Oral irritation was already present at the time of the initial examination, so the dog was administered medications to protect the gastrointestinal (GI) tract. These included sucralfate (500 mg mixed in water until a slurry forms and then given orally t.i.d. for five days) and famotidine (10 mg orally once daily for five days).

Since damage to the mucosa can be delayed and the full extent of the damage may not be recognizable until about 12 hours after the exposure,<sup>1</sup> the owner was instructed to monitor the dog at home for worsening lesions in the mouth, hypersalivation, lethargy, anorexia, and vomiting.

## Further treatment

About 18 hours after the exposure, the dog became lethargic, developed mild hypersalivation and anorexia, and was again presented to the veterinary clinic. The physical examination revealed moderate ulceration of the buccal mucosa and tongue. The dog's temperature was normal, and abdominal palpation did not seem to elicit pain. Results from a complete blood count and serum chemistry profile were normal. Tramadol (50 mg orally t.i.d. for five days) and amoxicillin-clavulanic acid (125 mg orally b.i.d. for seven days) were administered.

The dog was hospitalized for monitoring. Within four hours of hospitalization, the patient began eating small amounts of critical care canned dog food.

The dog was discharged 12 hours after admittance.





The owner was instructed to continue giving all medications (sucralfate, famotidine, tramadol, amoxicillin-clavulanic acid) for the labeled time frames and to only feed the dog canned food until the lesions in its mouth resolved. The dog was fully recovered seven days after the exposure.

## Discussion

Dry cell batteries contain an electrolyte solution or gel of either potassium hydroxide or sodium hydroxide, both of which are alkaline. Chemically,

alkaline materials generate an aqueous solution in which there are more hydroxyl ( $\text{OH}^-$ ) ions than hydrogen ( $\text{H}^+$ ) ions.<sup>2</sup> Alkaline materials can cause corrosive injury on contact with tissues through a process called *liquefaction necrosis*, which includes protein dissolution, collagen destruction, fat saponification, and cell membrane emulsification. During liquefaction necrosis, the tissues soften and allow the alkali to penetrate deeply into the tissues.<sup>1</sup> Exposure to an alkaline material causes little to no pain initially,

unlike exposure to an acid. Thus, patients are not deterred from accidental exposure.

In cases in which a battery is chewed and punctured, the alkaline material may leak out and cause localized tissue damage. If the battery was not swallowed, the damage is most likely to occur in the mouth, but it is also possible that there will be damage in the esophagus and farther down the GI tract. The esophagus is most at risk since it does not produce protective secretions that dilute the toxin like the mouth

# conventional

**Take a break**  
from the  
traditional.

**Try CVC's**  
**unconventional,**  
attendee-centric  
approach to  
**continuing**  
**education**  
conventions.

## IF YOU'VE NOT BEEN TO A CVC CONVENTION,

you're overlooking the industry's most unconventional, attendee-centric approach to continuing education.

- More than 500 hours of exceptional programming for the entire practice team
- The leading experts and most dynamic speakers in the profession
- Affordable registration, hotel, and dining options

**DON'T WAIT – REGISTER NOW FOR CVC SAN DIEGO!** Priority Code CVCAT037



**SAN  
DIEGO**  
DECEMBER  
4-7, 2014

**WASHINGTON  
DC**  
APRIL  
23-26, 2015

**KANSAS  
CITY**  
AUGUST  
28-31, 2015

**CALL** 800.255.6864, ext. 6

**CLICK** [TheCVC.com](http://TheCVC.com)

**EMAIL** [cvc@advanstar.com](mailto:cvc@advanstar.com)

**FOLLOW**  



### Oral Suspension for Cats

Veraflox (pradofloxacin) Oral Suspension for Cats  
25 mg/mL

For the treatment of skin infections (wounds and abscesses) in cats.  
Do not use in dogs.

#### BRIEF SUMMARY:

Before using Veraflox Oral Suspension for Cats, please consult the product insert, a summary of which follows:

#### CAUTION:

Federal law restricts this drug to use by or on the order of a licensed veterinarian. Federal law prohibits the extra-label use of this drug in food-producing animals.

#### PRODUCT DESCRIPTION:

Pradofloxacin is a fluoroquinolone antibiotic and belongs to the class of quinolone carboxylic acid derivatives. Each mL of Veraflox Oral Suspension provides 25 mg of pradofloxacin.

#### INDICATIONS:

Veraflox is indicated for the treatment of skin infections (wound and abscesses) in cats caused by susceptible strains of *Pasteurella multocida*, *Streptococcus canis*, *Staphylococcus aureus*, *Staphylococcus felis*, and *Staphylococcus pseudintermedius*.

#### CONTRAINDICATIONS:

**DO NOT USE IN DOGS.** Pradofloxacin has been shown to cause bone marrow suppression in dogs. Dogs may be particularly sensitive to this effect, potentially resulting in severe thrombocytopenia and neutropenia. Quinolone-class drugs have been shown to cause arthropathy in immature animals of most species tested, the dog being particularly sensitive to this side effect. Pradofloxacin is contraindicated in cats with a known hypersensitivity to quinolones.

#### HUMAN WARNINGS:

**Not for human use. Keep out of reach of children.** Individuals with a history of quinolone hypersensitivity should avoid this product. Avoid contact with eyes and skin. In case of ocular contact, immediately flush eyes with copious amounts of water. In case of dermal contact, wash skin with soap and water for at least 20 seconds. Consult a physician if irritation persists following ocular or dermal exposure or in case of accidental ingestion. In humans, there is a risk of photosensitization within a few hours after exposure to quinolones. If excessive accidental exposure occurs, avoid direct sunlight. Do not eat, drink or smoke while handling this product. For customer service or to obtain product information, including a Material Safety Data Sheet, call 1-800-633-3796. For medical emergencies or to report adverse reactions, call 1-800-422-9874.

#### ANIMAL WARNINGS:

**For use in cats only.** The administration of pradofloxacin for longer than 7 days induced reversible leukocyte, neutrophil, and lymphocyte decreases in healthy, 12-week-old kittens.

#### PRECAUTIONS:

The use of fluoroquinolones in cats has been associated with the development of retinopathy and/or blindness. Such products should be used with caution in cats. Quinolones have been shown to produce erosions of cartilage of weight-bearing joints and other signs of arthropathy in immature animals of various species. The safety of pradofloxacin in cats younger than 12 weeks of age has not been evaluated. The safety of pradofloxacin in immune-compromised cats (i.e., cats infected with feline leukemia virus and/or feline immune-deficiency virus) has not been evaluated. Quinolones should be used with caution in animals with known or suspected central nervous system (CNS) disorders. In such animals, quinolones have, in rare instances, been associated with CNS stimulation that may lead to convulsive seizures. The safety of pradofloxacin in cats that are used for breeding or that are pregnant and/or lactating has not been evaluated.

#### ADVERSE REACTIONS:

In a multi-site field study, the most common adverse reactions seen in cats treated with Veraflox were diarrhea/loose stools, leukocytosis with neutrophilia, elevated CPK levels, and sneezing.

#### ANIMAL SAFETY:

In a target animal safety study in 32, 12-week-old kittens dosed at 0, 1, 3, and 5 times the recommended dose for 21 consecutive days. One 3X cat and three 5X cats had absolute neutrophil counts below the reference range. The most frequent abnormal clinical finding was soft feces. While this was seen in both treatment and control groups, it was observed more frequently in the 3X and 5X kittens.

U.S. Patent No. 6,323,213

May, 2012

84364593/84364607, R.O

NADA141-344, Approved by FDA

Made in Germany

Bayer, the Bayer Cross and Veraflox

are registered trademarks of Bayer.

GHG052714

**Bayer**

Bayer HealthCare LLC  
Animal Health Division

Shawnee Mission, Kansas 66201, U.S.A.

## TOXICOLOGY CASE

and stomach do. Lesions in the esophagus may lead to perforation or, when healed, scar formation and contracture, leading to long-term esophageal stricture.<sup>1</sup>

If the battery has been ingested, in addition to the above concerns, it may also pose a foreign-body-obstruction threat, or if the battery remains in the stomach long enough for the casing to break down, heavy metals such as zinc or lead may be released and lead to toxicosis.

Clinical signs of irritation of the lips or tongue or in the mouth may occur within a few hours of exposure to a chewed battery, and ulceration may take up to 12 hours to fully develop.<sup>1</sup> The patient may also exhibit the clinical signs of lethargy, hypersalivation, dysphagia, anorexia, vomiting (potentially with blood), abdominal discomfort, hyperthermia, and melena.<sup>1</sup> Hyperthermia occurs, possibly because of corrosive tissue damage and inflammation from the alkali. Affected animals often show mild to moderate leukocytosis.

If the battery that was ingested is a button or disc battery, there are additional risks. Button batteries are found in many electronic devices including hearing aids, games, watches, calculators, and greeting cards. As described above, alkaline liquid can also seep from damaged disc batteries. In addition, there is the added risk of injury to adjacent tissues from the current flowing between the cathode and anode, which results in electrolysis of endogenous salt and the production of corrosive sodium hydroxide<sup>2</sup>

if the battery becomes lodged in the GI tract, particularly the esophagus. Thus, significant corrosive damage, including esophageal burns, necrosis, and perforation, can occur even if the button battery does not leak.<sup>1</sup>

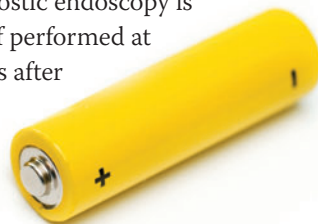
### Differential diagnoses

Mucosal burns can also be caused by thermal or electrical injury or due to exposure to other corrosive materials, such as acids, disinfectants, cationic-containing detergents or potpourri, automatic dishwasher detergent, formaldehyde, concentrated bleach (sodium hypochlorite), and phenols.

### Diagnosis

Diagnosis is based on a history of exposure and the consequent development of any of the clinical signs listed above. Since batteries have metal casings, radiography can be helpful in determining if any portion of the battery was swallowed and, if so, the location of the battery in the GI tract. In cases of button battery ingestion, radiography is particularly helpful in determining if the battery has become lodged in the esophagus.

Endoscopic examination of the oropharynx, esophagus, and stomach by using a flexible endoscope is recommended to determine if ulceration has occurred (since esophageal ulceration may be present even if no ulcers are present in the mouth) and to determine the severity of ulceration.<sup>1</sup> Diagnostic endoscopy is most useful if performed at least 12 hours after the exposure because the







## Discover the science.

**Veraflox® (pradofloxacin)**  
**Oral Suspension for Cats**

Efficacy. Safety. Ease-of-use.

**Find out more at [www.VerafloxOS.com](http://www.VerafloxOS.com)**

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian. Federal law prohibits the extra label use of this drug in food-producing animals. WARNINGS: For use in cats only. PRECAUTIONS: The safety of pradofloxacin in cats younger than 12 weeks of age has not been evaluated.

©2014 Bayer HealthCare LLC, Animal Health, Shawnee Mission, Kansas 66201  
Bayer, the Bayer Cross and Veraflox are registered trademarks of Bayer.  
V14975

See brief summary on page 324.



**Veraflox®**  
(pradofloxacin)

**Oral Suspension for Cats**

Designed specifically for the needs of cats.





development of the ulceration may be delayed, but it should be performed within 24 hours of the exposure. If a battery is identified radiographically in the esophagus or stomach, therapeutic endoscopy to remove the battery may be indicated.

### Treatment

Patients that have ingested corrosive materials should be given a small amount of milk or water immediately to dilute the corrosive material. (In this case, the window of opportunity for dilution had passed by the time the patient was presented to the clinic.) The recommended dose is 2 to 6 ml/kg orally, which is about 3 to 9 tbsp in a 50-lb dog.<sup>3</sup> If a button battery was ingested, giving serial doses of water (20 ml every 15 minutes) may delay and lessen the severity of the lesions.<sup>3</sup>

If the battery is leaking, emesis is contraindicated to prevent additional exposure of the esophagus to the alkaline corrosive material. Activated charcoal is also contraindicated since it is unlikely to bind to the corrosive material, may make visualization of ulceration difficult, and could be released into the abdominal cavity if GI perforation develops.<sup>3</sup>

Once a button battery has moved into the stomach, if it is not large compared with the size of the patient, it will likely

continue to pass through the GI tract and be expelled in the feces. A button battery lodged in the esophagus should be removed through endoscopy immediately since marked esophageal mucosal necrosis was observed in dogs after as little as 15 minutes of contact with a 3-volt disc battery.<sup>1</sup>

Bulking agents, such as wheat bread, psyllium, or canned pumpkin, may be helpful in moving small button batteries or battery pieces through the GI tract.<sup>3</sup> Sucralfate (0.5 to 1 g orally as a slurry t.i.d.) should be given to patients that develop mucosal irritation or ulceration, in addition to giving an H<sub>2</sub> blocker (e.g. famotidine 0.5 to 1 mg/kg orally daily to b.i.d.) or a proton pump inhibitor (e.g. omeprazole 0.5 to 1 mg/kg orally once a day).<sup>4</sup> These medications should be given until the clinical signs have resolved, often in seven to 10 days or longer. Patients with ulceration should also be given a broad-spectrum antibiotic to combat secondary infection.

Anorectic patients may need nutritional and fluid support. Opioid or opioid-like medications, such as tramadol (2 to 5 mg/kg orally two to four times a day), a fentanyl patch, or buprenorphine (0.005 to 0.02 mg/kg two to four times a day) can be given to lessen the pain of ulceration.<sup>4</sup>

### Monitoring

Monitor patients for 24 hours for clinical signs of GI irritation or ulceration. If ulceration develops, monitor the patient's complete blood count and body temperature. Perform endoscopy of the stomach or esophagus if needed to observe the extent of mucosal damage or to remove a battery seen on radiographs.

### Summary

Alkaline battery exposure in dogs can cause corrosive injury and GI ulceration, especially in the mouth and esophagus. Esophageal ulceration can lead to perforation and stricture formation. Treatment measures may include immediate dilution with milk or water; the administration of GI protectants, pain medications, broad-spectrum antibiotics, liquid food, and supportive care; and the removal of the battery or pieces of the battery through endoscopy or surgery. **VM**

### REFERENCES

1. Gwaltney-Brant S. Batteries. In: Plumlee KH, ed. *Clinical veterinary toxicology*. St. Louis: Mosby Elsevier, 2004;140-142.
2. Litovitz T. Button batteries. In: Ford MD, Delaney KA, Ling LJ, et al., eds. *Clinical toxicology*. Philadelphia: WB Saunders Co, 2001;1027-1031.
3. DeClementi C. Prevention and treatment of poisoning. In: Gupta RC, ed. *Veterinary toxicology: basic and clinical principles*. London: Elsevier, 2012;1364-1368.
4. Plumb DC. *Plumb's veterinary drug handbook*. 5th ed. Ames, Iowa: Blackwell Publishing, 2005; 321, 573, 722, 774.



# Clinical Rounds CE

## Transitional cell carcinoma

Thousands of dogs develop this form of cancer every year. Follow along as these clinicians delve in the particulars of a case in a senior Chihuahua—and see how you can best prolong survival in the next patient you diagnose with this form of neoplasia.

**T**ransitional cell carcinoma (TCC) is the most common urinary tract cancer in dogs, affecting thousands each year.<sup>1-4</sup>

Risk factors for developing TCC are multiple and include obesity, female sex, exposure to older-generation flea control products, and exposure to herbicides and pesticides.<sup>2,5-8</sup>

Scottish terriers, Shetland sheepdogs, beagles, wire-haired fox terriers, and West Highland white terriers have a predilection to develop TCC.<sup>2,5-8</sup> The Scottish terrier is the most at-risk breed for developing this tumor—an odds ratio of 18.09.<sup>2</sup> Additionally, obese female dogs exposed to insecticides are 28 times more likely to develop TCC than normal weight dogs.<sup>6,8</sup> Interestingly, consuming vegetables at least three times a week in addition to a normal diet seems to reduce the risk of developing TCC in dogs.<sup>9</sup>

A “field effect” has been proposed for these tumors and refers to the multifocal changes that occur in the bladder as a result of exposure to carcinogens in the urine that cause malignant changes throughout the bladder epithelium. Metastasis to the regional lymph nodes and the lungs is noted in about one of six cases at the time of diagnosis, but it is more common later in the course of disease,

with about half of dogs developing metastasis to the lymph nodes, lungs, other abdominal organs, or bones at the time of death.<sup>5,10,11</sup>

Dogs usually present with lower urinary tract signs (e.g. hematuria, stranguria, polakiuria, dysuria), and many have concurrent urinary tract infections (UTIs) that may initially delay the diagnosis. Resolving the infection may temporarily alleviate the clinical signs, and patients often present with a several-month history of lower urinary tract signs. A middle-aged dog with its first UTI should prompt imaging of the bladder to rule out bladder stones or a bladder mass.

### CASE PRESENTATION

An about 16-year-old spayed female Chihuahua (5.5 lb [2.5 kg]) presented to the University of Tennessee Veterinary Medical Center for evaluation of a suspected bladder mass found on ultrasonographic examination by the primary care veterinarian. The owners reported that the dog had a history of hematuria for about three months before presentation.

### Diagnostic testing

Staging tests included a complete physical examination, a complete blood count, a

### THE TEAM

Sara D. Allstadt, DVM,  
DACVIM (oncology)\*

Nathan Lee, DVM,  
DAVCR (radiation  
oncology)\*

Jennifer L. Scruggs, DVM,  
PhD\*\*

Jennifer Bernard, DVM,  
DACVP\*\*

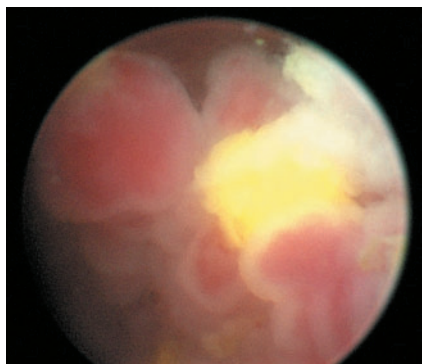
Silke Hecht, Dr. med. vet.,  
DACVR, DECVDI\*

Amanda Callens, BS, LVT\*  
Rachel Seibert, DVM\*

Joseph Bartges, DVM, PhD,  
DACVIM, DACVN\*

\*Department of Small  
Animal Clinical Sciences

\*\*Department of  
Biomedical and  
Diagnostic Sciences  
College of Veterinary  
Medicine  
University of Tennessee  
Knoxville, TN 37996



**>>>1.** A cystoscopy image of the dog's tumor revealing a polypoid mass and areas of necrosis and dystrophic mineralization.

serum chemistry profile, a urinalysis, an abdominal ultrasonographic examination, an abdominal and thoracic (three-view) radiographic examination, and a urine culture. The abdominal ultrasonographic examination showed a thickening of the bladder wall, with two masses measuring 0.38 x 0.64 cm and 1.9 x 2.3 cm and extending along the craniodorsal and cranioventral wall of the bladder. No other abnormalities were noted. Thoracic and abdominal radiographs revealed no abnormalities and no evidence of metastatic disease.

The dog was anesthetized and positioned in dorsal recumbency for a cystoscopic examination, which revealed multiple botryoid masses along the

dorsal bladder wall close to the ureters (*Figure 1*). Histopathologic examination of biopsy samples revealed TCC, and a culture was positive for *Enterococcus* species that was susceptible to amoxicillin-clavulanic acid.

## Treatment

Surgical excision was not possible because of the proximity of the tumor to the ureters. Initial treatment included mitoxantrone chemotherapy administered intravenously every three weeks at a dose of 5 mg/m<sup>2</sup> in conjunction with piroxicam given orally daily at a dose of 0.3 mg/kg. A complete blood count was performed before and seven days after each mitoxantrone treat-

## RADIOLOGY PERSPECTIVE

Silke Hecht, Dr. med. vet., DACVR, DECVDI



Diagnostic imaging in dogs with suspected bladder or urethral TCC is performed to identify lesions and, if identified, assess the extent of disease, evaluate for metastatic disease, and monitor tumor response to treatment. Survey radiographs of the abdomen are useful to identify enlarged sublumbar lymph nodes and evaluate the lumbar and sacrocaudal spine and the pelvis for evidence of osseous metastases or extension of the tumor into the spinal column or pelvis. The primary mass is usually not identified; however, dystrophic mineralization within the tumor or a thickened urethra may be seen in some cases (*Figure 2*).

Radiographic contrast procedures (cystography, urethrography) have largely been replaced by ultrasonography in the diagnosis of urinary tract neoplasia. However, lesions in an intrapelvic location may be better evaluated by using urethrography or computed tomography (CT) instead of ultrasonography in select cases.



**>>>2.** A lateral radiograph of the caudal abdomen of a 14-year-old Belgian shepherd with urinary bladder TCC. The radiograph shows irregular stippled mineralization in the plane of the caudal bladder and an unusual contour to the bladder neck area (arrows). Additional findings include mild sublumbar lymph node enlargement (asterisk) and incidental spinal degenerative changes.

It is important to note that 2D ultrasonography has historically been shown to be an inaccurate method of consistently measuring bladder masses.<sup>17</sup> Recently, however, 3D ultrasonography and CT have been shown to provide accurate bladder mass measurements, although the availability of CT and 3D ultrasonography is more limited than the availability of 2D ultrasonography.<sup>18</sup> On abdominal ultrasonographic examination, bladder TCCs



ment. Serum chemistry profiles were performed intermittently.

## Follow-up

Treatment with mitoxantrone was continued every three weeks, and restaging tests were performed every six weeks to monitor tumor status. Restaging consisted of three-view thoracic radiographs, two-view abdominal radiographs, and abdominal ultrasonography to monitor primary tumor size as well as to monitor for evidence of the development of metastasis. For four months, the tumor remained stable based on imaging and clinical signs.

By the time the dog presented for its seventh mitoxantrone treatment,

the owner noted that it was less active and was more particular about what it wanted to eat. A complete blood count, serum chemistry profile, urinalysis, and urine culture, as well as abdominal and thoracic imaging, revealed no explanation for the change in the dog's quality of life. No evidence of metastatic disease could be documented, and the tumor appeared relatively stable on abdominal ultrasonographic examination. The owner elected to discontinue chemotherapy since the dog's clinical signs were presumed to be from the chemotherapy treatment.

One month later, the dog presented to the primary care veterinarian because it was lethargic. Blood work

revealed severe hyperglycemia, azotemia, and elevated liver enzyme activities. The owner elected to humanely euthanize at that time. The dog's survival time from diagnosis to death was five months. A necropsy was not performed to confirm the cause of the dog's declining quality of life.

**Editors' note:** *Two more perspectives—clinical pathology by Dr. Jennifer Scruggs and anatomic pathology by Dr. Jennifer Bernard—are available online at [dvm360.com/TCC](http://dvm360.com/TCC).*



Dr. Scruggs

Dr. Bernard

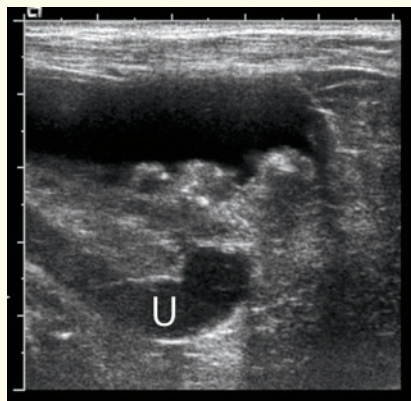
are usually sessile, irregularly shaped masses of variable echogenicity.<sup>19</sup> They are most commonly located at the level of the trigone but may be found in any location. Diffuse infiltration of the bladder wall instead of formation of a distinct mass is less common but possible. Urethral TCCs result in hypoechogenicity and irregular thickening of the urethral wall, often with a hyperechoic line along the epithelial surface.<sup>20</sup>

Possible concurrent findings include abnormalities of the prostatic gland, hydronephrosis or hydroureter sec-

ondary to ureteral obstruction (*Figure 3*), and evidence of metastatic disease to the lumbar spine, medial iliac lymph nodes, or other abdominal organs. Samples of bladder or urethral masses should ideally be obtained by means of ultrasound-guided traumatic catheterization ("suction biopsy") instead of percutaneous tissue sampling because of the risk of tumor cell implantation along the needle tract.<sup>12</sup> This is especially important for apical tumors in which surgery may be possible.

When monitoring a patient's response to treatment, it is important to keep the ultrasound technique and protocol (e.g. positioning, degree of bladder filling, radiologist) as consistent as possible between examinations to minimize the chance of measurement errors.

CT and magnetic resonance imaging (MRI) of the abdomen are useful in evaluating the primary tumor and associated changes. However, because of the need for general anesthesia, high cost, and low availability, the use of cross-sectional imaging in veterinary practice is currently limited. Thoracic imaging (radiography or, optimally, CT) should be routinely performed in patients with urinary tract TCC to evaluate for metastatic disease to the lungs or osseous structures.



**>>>3.** A sagittal ultrasonogram of the urinary bladder demonstrating an irregularly marginated, broad-based mass of mixed echogenicity with multiple strongly hyperechoic foci associated with the dorsal wall of the urinary bladder. A markedly dilated ureter (U) is seen dorsal to the bladder, consistent with ureteral obstruction by the mass.

## MEDICAL PERSPECTIVE

Joe Bartges, DVM, PhD, DACVM,  
DACVN, and Amanda Callens, BS, LVT



Dogs with TCC often have clinical signs of lower urinary tract disease (dysuria, stranguria, hematuria, and inappropriate urination) that

may or may not be associated with concurrent bacterial UTIs. Alpha<sub>1</sub> antagonists may decrease lower urinary tract signs. Conventionally, prazosin (1 mg/15 kg body weight orally every 12 to 24 hours) and phenoxybenzamine (0.25 to 1 mg/kg body weight orally every eight to 24 hours) have been used; however, tamsulosin (0.001 to 0.1 mg/kg orally every 24 hours) has been shown to be superior.<sup>21</sup> Tamsulosin accumulates in urethral and prostatic tissues, providing a more sustained effect.<sup>22,23</sup>

### Bacterial UTIs

Dogs with TCC are prone to bacterial UTIs, which are considered complicated because of urine retention due to mechanical blockage and presence of the cancer. Antimicrobial agents should be based on culture and sensitivity results since resistant UTIs are common. Although cystocentesis is controversial in dogs that have TCC due to the possibility of seeding tumors along the needle tract, urine should be collected by cystocentesis for culture and sensitivity testing. Not all bacterial UTIs require treatment; if clinical signs are not present or are no worse with a positive bacterial culture,

then not treating is reasonable.<sup>24</sup>

Other nonantimicrobial treatments may be considered to aid in the control of bacterial UTIs, such as urinary antiseptics: methenamine mandelate (10 to 20 mg/kg orally with food every eight to 12 hours), methenamine hippurate (500 mg orally with food every 12 hours), or nitrofurantoin (3 to 4 mg/kg orally every 24 hours). Also consider probiotics, cranberry extract, and D-mannose.

### Urethral obstruction

With time and despite treatment, urethral obstruction commonly occurs due to growth of the TCC at the urethral opening and down the urethral wall. Many patients still appear to feel well and do not have metastatic disease but are unable to urinate. There are several options for these obstructed patients—intermittent urinary catheterization, transurethral catheter placement, cystostomy catheter placement, and urethral stents. Intermittent urinary catheterization is only a temporary solution. If euthanasia is not considered, then alternative options for promoting urine voiding should be pursued.

Cystostomy catheters are low-profile tubes that are surgically placed into the urinary bladder and exit the abdominal cavity in the inguinal area. Owners empty the urinary bladder three to four times a day by using a syringe. We use bladder irrigation to help control bacterial UTIs with a cystostomy tube. Bladder irrigation is performed with a 0.02% chlorhexidine solution, and 20 to 30 ml is

instilled in the bladder through the cystostomy tube after the urine is removed. It is allowed to dwell for 10 to 15 minutes, and then all but 10 ml is removed. This 10-ml 0.02% chlorhexidine solution is allowed to remain in the urinary bladder until the next time urine is removed.

Self-expanding nitinol urethral stents are placed by fluoroscopic or ultrasonographic guidance and permanently open the urethra. Most female dogs are incontinent after urethral stent placement, which may cause some concerns for home and owner exposure to chemotherapy if treatment is pursued after stent placement. Median survival times after stent placement are 32 to 78 days, with some dogs living up to a year.<sup>25,26</sup> Complications of stent placement include incontinence (39%), reobstruction (22%), stent migration, and bladder atony. About 20% of dogs with stents may develop urethral obstruction due to progressive growth of the tumor; of these about 10% obstruct due to ingrowth of the tumor through the stent, while about 90% obstruct due to growth of the tumor around the cranial and/or caudal aspects of the stent.<sup>27</sup>

### Ureteral obstruction

If ureteral obstruction occurs due to a TCC, urinary diversion can be performed by either ureteral stents or a subcutaneous ureteral bypass device. Recently, laser ablation of TCC has been described, which may provide relief of clinical signs and possibly longer control of the cancer when used in conjunction with chemotherapy.<sup>28</sup>

## SURGICAL PERSPECTIVE

Rachel Seibert, DVM



Complete TCC resection is difficult because masses usually involve the trigone region and are commonly multifocal, either within the bladder or in the bladder and urethra (in 56% of dogs in one study).<sup>2</sup> Because the important neurovascular structures of the bladder are located dorsally, resection of this area is likely to result in incontinence, ischemia, or both. In the aforementioned study of 67 dogs undergoing surgery for TCC, complete resection was possible in less than 3% of affected dogs.<sup>2</sup> For these reasons, surgical treatment is considered palliative in most cases and is often used in combination with chemotherapy and nonsteroidal anti-inflammatory drug (NSAID) therapy.

### Partial cystectomy

Partial cystectomy is indicated to alleviate obstruction and for debulking in combination with chemotherapy. Major complications of partial cystectomy include dehiscence resulting in uroabdomen, incontinence if the neurovascular supply is damaged, pollakiuria due to reduced bladder capacity, incomplete tumor resection, and recurrence. Urinary catheters are recommended after cystectomy to keep the bladder decompressed, reducing tension on the suture line. In a study of 10 dogs undergoing partial cystectomy for TCC, nine of the dogs developed recurrence or metastasis, and 50% were euthanized within

seven months of surgery.<sup>29</sup>

Although wide surgical margins can be attempted for apical masses, reduction in bladder capacity may result in persistent pollakiuria.<sup>29,30</sup> In people, more than 75% of the bladder can be excised with development of a near-normal capacity within three months<sup>31</sup>; however, the percentage of bladder that can be excised in dogs without long-term pollakiuria or incontinence is unknown. In dogs undergoing 90% cystectomy with only the trigone left intact, mean bladder capacity nine months after surgery was still decreased 72% from baseline, and all dogs had pollakiuria.<sup>30</sup> The rate of persistent pollakiuria is 20% when cystectomy includes 40% to 70% of the bladder.<sup>29</sup>

Because of metabolic complications and poor quality of life, complete cystectomy with urinary diversion is no longer performed.<sup>32</sup> An alternative to complete cystectomy is en bloc removal of the bladder neck and proximal urethra with preservation of the dorsal neurovascular pedicle. The goal of en bloc resection is to optimize the probability of achieving long-term tumor control, while attempting to preserve function. This technique was recently described in two dogs in which tumors were causing life-threatening obstruction of the urethra and ureters.<sup>33</sup> Both dogs regained continence by 17 days after surgery.

Surgical resection of TCC has been associated with tumor seeding of the abdominal wall or other distant sites.<sup>34-36</sup> Seeding of TCC is also suspected to occur with cystocente-

sis, traumatic urethral catheterization, cystoscopy, and laparoscopy.<sup>12,36</sup> When TCC is suspected, the surgeon should minimize tumor handling and change gloves and instruments before body wall closure to reduce the risk of iatrogenic spread.

### Palliative treatment

Options for palliative treatment of trigonal TCC include placement of a permanent cystostomy tube, radiation therapy with or without placement of a self-expanding urethral stent, stent placement alone, or laser debulking. A permanent cystostomy tube permits urine diversion in patients that have urethral obstruction but patent ureters. Complications are reported in 49% of dogs and cats undergoing cystostomy catheter placement and include tube dislodgement or obstruction, urine leakage around the tube, persistent fistulation after tube removal, inflammation around the tube exit site, and death secondary to tube complications.<sup>37</sup> UTIs are also expected with long-term tube placement.

Tumors that obstruct the urethra and trigone can also be debulked with ultrasound-guided endoscopic diode laser ablation. When laser debulking is combined with medical management, the median survival time was 380 days in one report.<sup>28</sup> Multiple treatments are required for up to 50% of cases because of reobstruction with tumor or scar tissue. Other complications include stranguria, hematuria, urethral perforation, and spread of TCC within the urinary tract.<sup>28</sup>



## MEDICAL ONCOLOGY PERSPECTIVE

Sara D. Allstadt, DVM,  
DACVIM (oncology)



Chemotherapy is often used to treat TCC because of the common trigone location of these tumors as well as common urethral and/or prostatic involvement. Reduction of tumor burden for TCC in dogs has not been well-studied but has been shown to prolong survival times.<sup>38-40</sup>

### Chemotherapy agents

Systemic chemotherapy is often the primary form of treatment for TCC. Standard approaches include either treatment with NSAIDs alone or in combination with systemic chemotherapy agents. Treatment with NSAIDs such as piroxicam, deracoxib, and firocoxib has been reported, although piroxicam is commonly favored as the first-line NSAID by most oncologists, likely because of the higher-reported complete response rate to this drug.<sup>41-43</sup> Complete responses have been reported in a small number of cases treated with piroxicam alone, with a median survival time of 5.9 months.<sup>41</sup> In a report of 26 deracoxib-treated dogs, the median survival time reported was longer; however, those dogs received other chemotherapy agents after deracoxib treatments, likely influencing their overall survival times.<sup>43</sup>

Chemotherapy agents used in combination with NSAIDs include mitoxantrone, carboplatin, vinblastine, gemcitabine, vinorelbine, and metronomic chlorambucil. Intrave-

sicular treatment with mitomycin C has also been reported.<sup>44</sup> While favorable tumor responses to cisplatin chemotherapy and piroxicam are noted, this combination is not recommended because of the high nephrotoxicity and risk of renal failure.<sup>45,46</sup> (See Table 1 at [dvm360.com/TCC](http://dvm360.com/TCC) for a summary of the study results for these chemotherapy agents.)

Mitoxantrone combined with piroxicam is one of the more commonly used chemotherapy protocols for canine TCC.<sup>47</sup> The dose of mitoxantrone is typically 5 to 5.5 mg/m<sup>2</sup> administered intravenously every three weeks, and piroxicam is administered at 0.3 mg/kg orally once daily with food. Mitoxantrone can cause marked bone marrow suppression, so it is important to monitor the nadir via complete blood counts seven days after administration.

Piroxicam can cause both gastrointestinal upset and nephrotoxicosis, so routine monitoring of a patient's gastrointestinal signs and renal function is recommended. Omeprazole and famotidine are commonly used to reduce risk of gastrointestinal upset. Misoprostol is a synthetic prostaglandin E1 analogue commonly used to prevent NSAID-induced ulceration; however, in my experience, a high number of dogs experience gastrointestinal cramping and upset from this drug. It is also an abortifacient and, thus, women of child-bearing age should not be exposed to this drug.

### Prognostic factors

Overall, the prognosis for dogs with TCC is poor, and most dogs succumb to this disease. But new treatments are

being identified on a regular basis, and quality of life can be excellent in most dogs while receiving chemotherapy. Dogs with more advanced-stage TCC (e.g. larger tumors invading loco-regionally or with evidence of metastasis) have a less favorable prognosis than those with a lower-stage disease (e.g. smaller, more superficial tumors with no evidence of metastasis).<sup>48</sup> Younger dogs have an increased risk of metastasis to lymph nodes, dogs with prostate involvement have an increased risk of distant metastasis, and dogs with larger tumors have an increased risk for both nodal and distant metastasis.<sup>49,50</sup> Those with either loco-regional or distant metastasis, as well as dogs whose tumors invade the prostate, urethra, uterus, vagina, and pelvic canal, typically succumb to their disease or experience obstruction from their tumors quicker than those with smaller or more apically located tumors and without evidence of metastasis.<sup>49,50</sup>

The survival data for dogs with TCC is hard to summarize since many publications describe heavily pretreated dogs or dogs that go on to receive other treatments. However, some deductions may be made from the published data. With NSAID therapy alone, the expected median survival time is about six months, while adding chemotherapy to NSAID therapy is expected to increase the median survival time to approximately nine to 11 months (see Table 1 at [dvm360.com/TCC](http://dvm360.com/TCC)). It is unknown at this time how new procedures such as urethral and ureteral stents and radiation therapy may affect survival times, but these modalities are expected to potentially increase survival.

**Apply for CE credit:** Read this entire article online at [dvm360.com/TCC](http://dvm360.com/TCC) and then visit [dvm360.com/VetMedCE](http://dvm360.com/VetMedCE) to earn two hours' CE credit from Kansas State University. This test will be accepted for grading until Nov. 1, 2015.

## RADIATION ONCOLOGY PERSPECTIVE

**Nathan Lee, DVM, DAVCR (radiation oncology)**



Radiation therapy alone—or in combination with chemotherapy, surgery, or both—has been shown to be the best treatment in people with invasive TCCs, which are similar to canine TCC of the bladder.<sup>51-55</sup> Radiation therapy has not been extensively studied or recommended as treatment for canine TCC, most likely because of the relatively low availability of veterinary radiation centers. An early report looking at canine bladder cancers treated with intraoperative radiotherapy reported a high rate of post-radiation complications, with 46% of dogs experiencing increased frequency of urination, 46% urinary incontinence, 38% cystitis, and 15% stranguria.<sup>56</sup> The complications reported in that article were not surprising since the investigators treated the entire bladder and used a very high fraction dose of 21.88 to 27.00 Gy.<sup>56</sup> Even with the reported complications, the median survival time in that report was 16.8 months, which may indicate that radiation therapy may have a role in treatment of this tumor.<sup>56</sup>

A more recent report in 2004 investigated the use of piroxicam, mitoxantrone, and palliative radiation therapy (six weekly fractions of 5.75 Gy) in 10 dogs with TCC.<sup>57</sup> That study concluded that the combination of therapies, which has a response rate of 22% based on ultrasound measurements, was not superior to reports using mitoxantrone and piroxicam alone, which had a response rate of 34.5% based on ultrasound measurements.<sup>46,57</sup> Although this finding was not as promising as expected, 90% of patients had amelioration of their urinary clinical signs, and only three dogs were reported to have urinary incontinence as a late side effect.<sup>57</sup>

A recent study in 2012 investigated the use of radiation therapy to treat TCCs using intensity-modulated radiation therapy, along with image guidance in 21 dogs.<sup>58</sup> That study

found that the combination of definitive radiotherapy (54 to 58 Gy delivered in 20 daily fractions on a Monday to Friday basis) and chemotherapy resulted in a median survival time of 654 days.<sup>58</sup> Acute urinary complications included hematuria (1) and stranguria (1).<sup>58</sup> Late complications reported were rectal (1), ureteral (1), and urethral (2) strictures.<sup>58</sup> Overall, 19% of patients developed grade three late gastrointestinal or genitourinary toxicosis that typically occurred six to 18 months after radiation therapy.<sup>58</sup> All late complications were successfully palliated with either stenting or surgery.<sup>58</sup>

At the University of Tennessee, we have successfully palliated patients with TCCs of the urinary bladder using 8-Gy fractions once a week for three treatments. With this therapy, we have seen clinical improvement with amelioration of urinary signs in most patients. Anecdotally, we see the most significant improvement seven to 14 days after radiotherapy. Palliative radiation therapy is typically reserved for patients that have failed chemotherapy options. The use of higher fraction sizes to treat TCCs was recently validated in a study from the University of Florida that determined the alpha/beta ratio of three established canine TCC cell lines was low, ranging from 2.67 to 4.<sup>59</sup> Cells with a low alpha/beta ratio tend to respond to large fraction sizes better than small fraction sizes, similar to late responding tissues in the body.

It is difficult to figure out the role of radiation therapy in the treatment of canine TCCs because of the few studies available, the small number of patients in each study, and the absence of practice standardization in veterinary radiation oncology. More study is required to fully define the role of radiation therapy in management of canine TCC of the bladder and determine how to reduce complications associated with this therapy. However, my experience combined with literature in both people and dogs affected by this disease suggest that this treatment modality should play a role in management of these dogs.

## SUMMARY

At the University of Tennessee, piroxicam is the NSAID of choice for medical management of canine TCC, although deracoxib may be considered as well.<sup>41,43</sup> Mitoxantrone is typically chosen as the first-line chemotherapy drug, although other drugs considered and used in the

treatment of canine TCC include vinblastine, carboplatin, and chlorambucil, based on the literature and clinical tolerance of canine patients.<sup>45,47,60-63</sup> It is important to note that several of these chemotherapy drugs should be dosed differently in small dogs (< 22 to 33 lb [10 to 15 kg]). Urethral and ureteral stenting, as well as radiation

therapy, may all be considered as part of a management plan for TCC dogs.

For dogs being treated (particularly those treated with chemotherapy), we use imaging and restaging about every six to eight weeks to monitor response to treatment and determine if alternative therapy is indicated. **VM**

To view the references for this article, visit [dvm360.com/TCC](http://dvm360.com/TCC).



## DENTAL PRODUCTS

LEBALAB

Search

**LEBA III™**

# Have you Discovered Leba III?

100% Response in Double Blind Tests  
See the Results on [www.lebalab.com](http://www.lebalab.com)

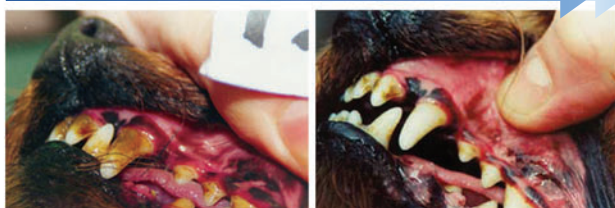
35 Days Later



Before

After

28 Days Later



Before

After



## Cleans Teeth with the Ease of a Spray

The LebaLab difference:

Leba III stimulates the good flora in the saliva. The longer Leba III is used, the cleaner the teeth and the healthier the chemistry of the mouth becomes. Antibacterial products kill the good bacteria in the mouth leading to imbalance and repeated dental procedures.

Pets ingest dental products, they cannot rinse. They can become subject to the side effects of the components, that's why Leba III contains no Grapefruit Seed Extract, no chlorides or chemical agents.

Used by veterinarians since 1994.

**To order, call toll free: 1-866-532-2522**

[www.lebalab.com](http://www.lebalab.com) | [tellus@lebalab.com](mailto:tellus@lebalab.com) | Questions? Call 1-519-542-4236

**LebaLab Inc.**





## ANESTHESIA EQUIPMENT

**BLUEPRINT FOR BREATHING**  
Anesthesia made simple... A.D.S. 2000

Proudly made in the U.S.A.



**Revolutionary Veterinary Breakthrough**

- Anesthesia Machine (Positive Pressure)
- Electronically microprocessor controlled
- Delivery & Ventilation for small animal use
- Automatically sets breathing parameters
- Very affordable and easy to use
- Just connect to vaporizer & Oxygen
- Two year parts & labor warranty
- Free lifetime loaner service

**NEWLY ADDED FEATURE !!!** 12 Hour Battery backup providing portability and protection

**engler**  
engineering corporation

In Business Since 1964

1099 East 47th Street - Hialeah, Florida 33013 USA  
**800-445-8581 - FAX 305-685-7671**  
**www.englerusa.com**


**dvm360.com**

## DIAGNOSTIC TESTING

**NOSORB™** *Easy Urine Collection from Cats*

- Nonabsorbent cat litter
- Comes in urine cup
- Easily dispensed or used in hospital
- Clients love it
- Inexpensive, bulk 5lb. tub with scoop
- Readily accepted by cats
- Inert—will not affect test results
- Recommended and used by Veterinary urologists at many Veterinary teaching hospitals

Available through your Veterinary Distributor, or contact:  
CATCO, 140 SE 23rd St., Cape Coral, FL 33990 for information  
Visit our Web Site at [HTTP://www.bpsom.com/catco/catco.htm](http://www.bpsom.com/catco/catco.htm) for distributor information.



## MEDICAL EQUIPMENT

CALL US FOR A **FREE SAMPLE**



**BiteNot**  
The collar that cares

**The Comfortable Alternative to the Elizabethan Cone**  
— Available from Distributors —  
Call us for a free sample.

**1-800-424-8366**  
[www.bitenot.com](http://www.bitenot.com)

## TAGS

**TAGS**

Online Interactive Order System




[www.nationalband.com](http://www.nationalband.com)  
[tags@nationalband.com](mailto:tags@nationalband.com)

Highest Quality, Faithful Service, Honest Values Since 1902

**NATIONAL BAND AND TAG CO.**  
721 York St PO Box 72430  
Newport KY 41072-0430 USA  
(859) 261-2035 Fax (800) 261-TAGS (8247)



# Follow us!

Get instant updates on critical developments in veterinary medicine, business, and news by following **dvm360**.

[facebook.com/dvm360](https://facebook.com/dvm360)  
[twitter.com/dvm360](https://twitter.com/dvm360)

## Spin your centrifuge clean



I find cleaning the centrifuge to be tedious, especially since we use a sugar solution. Also, there just never seems to be enough time to clean it. The easiest way I have found to clean ours is to wrap a hot, moist (not dripping wet) towel around the inside of the centrifuge. Then I turn the machine on to the lowest speed for the longest cycle possible. Once the centrifuge is done spinning, I remove the towel and the centrifuge is clean—with no mess and no fuss!

*Holly Meno, LVT  
Chesterfield, Michigan*

We need your ideas!

We'll pay **\$50** for regular submissions and **\$75** for video submissions that we publish in print or online.

Email [vm@advanstar.com](mailto:vm@advanstar.com),  
fax us at (913) 273-9876,  
or write to Idea Exchange  
Editor at 8033  
Flint, Lenexa, KS  
66214.



## Reduce fecal fumes with a compost bin

Our lab area can get pretty stinky when fecal samples sit out on the counter, waiting to be read or to be packaged for the off-site laboratory. So when we know there is going to be a delay between receiving the sample and being able to process it, we place the well-labeled sample into a compost bin with a built-in charcoal filter. The



bin sits at a specific place on the counter when empty and is moved next to the microscope when it has a sample in it, so the technician knows to process it. Adding this step to our fecal sample processing routine has substantially cut down on bad smells in the lab area.

*The staff at Arbor Animal Hospital  
La Grange Park, Illinois*

**dvm360**  
Find it all here.

### Read the latest Miller online A vaccination proclamation

Dr. Robert Miller espouses the importance of this medical advance for pets and people. Find this and previous columns by visiting

[dvm360.com/Miller](http://dvm360.com/Miller).



### Also online ...



Reliable and consistent  
anesthesia in large carnivores  
[dvm360.com/MedicineVideos](http://dvm360.com/MedicineVideos)



CAPC's Tick of the Month:  
Western blacklegged tick  
[dvm360.com/capc](http://dvm360.com/capc)

Veterinary Medicine (ISSN 8750-7943 print; ISSN 1939-1919 online) is published monthly by Advanstar Communications Inc., 131 West First St., Duluth, MN 55802-2065. One year subscription rates: \$60 in the United States and Possessions; \$72 in Canada and Mexico; \$97 in all other countries. Single issue orders: \$18 in the United States and Possessions; \$22 in Canada and Mexico; \$24 in all other countries. Periodicals postage paid at Duluth, MN 55806 and additional mailing offices. POSTMASTER: Please send address changes to Veterinary Medicine, P.O. Box 6087, Duluth, MN 55806-6087. Canadian GST Number: R-124213133RT001. Publications Mail Agreement Number: 40612608. Return undeliverable Canadian addresses to: IMEX Global Solutions, P.O. Box 25542, London, ON N6C 6B2, Canada. Printed in the U.S.A. © 2014 Advanstar Communications Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including by photocopy, recording, or information storage and retrieval without permission in writing from the publisher. Authorization to photocopy items for internal/educational or personal use, or the internal/educational or personal use of specific clients is granted by Advanstar Communications Inc. for libraries and other users registered with the Copyright Clearance Center, 222 Rosewood Dr. Danvers, MA 01923, 978-750-8400 fax 978-646-8700 or visit <http://www.copyright.com> online. For uses beyond those listed above, please direct your written request to Permission Dept. fax 440-756-5255 or email: [mcannon@advanstar.com](mailto:mcannon@advanstar.com). Advanstar Communications provides certain customer contact data (such as customers' names, addresses, phone numbers, and e-mail addresses) to third parties who wish to promote relevant products, services, and other opportunities which may be of interest to you. If you do not want Advanstar Communications to make your contact information available to third parties for marketing purposes, simply call toll-free (866) 529-2922 between the hours of 7:30 a.m. and 5 p.m. CST and a customer service representative will assist you in removing your name from Advanstar's lists. Outside the United States, please call (218) 740-6477. Veterinary Medicine does not verify any claims or other information appearing in any of the advertisements contained in the publication, and cannot take responsibility for any losses or other damages incurred by readers in reliance on such content. Publisher assumes no responsibility for unsolicited manuscripts, photographs, art, and other material. Unsolicited material will not be returned. Address correspondence to Veterinary Medicine, 8033 Flint, Lenexa, KS 66214; (913) 871-3800; e-mail [vm@advanstar.com](mailto:vm@advanstar.com). To subscribe, call toll-free 888-527-7008. Outside the U.S. call 218-740-6477.

# CVC's approach to the delivery of continuing education is so simple it's **unconventional!**

## THE CONTINUING EDUCATION YOU WANT

- Exceptional programming, led by the industry's most accomplished educators and experts
- A schedule built to maximize your opportunity to earn CE credits

## WHERE YOU WANT IT

- Choose an East Coast, West Coast, or Midwestern location to suit your available time and budget
- Each with a convention atmosphere conducive to your learning experience

**Try CVC's unconventional, attendee-focused approach  
to continuing education conventions.**



**SAN  
DIEGO**  
DECEMBER  
4-7, 2014

WASHINGTON  
**DC**  
A P R I L  
23-26, 2015

KANSAS  
**CITY**  
AUGUST  
28-31, 2015

CALL 800.255.6864, ext. 6 CLICK [TheCVC.com](http://TheCVC.com) EMAIL [cvc@advanstar.com](mailto:cvc@advanstar.com) FOLLOW  

un  
con  
ven  
tion  
al





# Expired. No bite required.



Your clients don't want dangerous parasites feeding on their dog. That's why Vectra 3D® kills through contact so parasites don't have to bite to die, and is only authorized for sale by veterinarians – the best source for the right care for dogs.

## Why wait for the bite? Protect the love with Vectra 3D.®

ADVANCED CONTROL AGAINST FLEAS, TICKS & MORE



Fleas



Ticks



Mosquitoes



Lice



Mites



Flies

DO NOT USE VECTRA 3D ON CATS.

[vctrapet.com](http://vctrapet.com)

©2014 Ceva Animal Health, LLC, Lenexa, KS 66215  
All trademarks are the property of Ceva Animal Health, LLC.